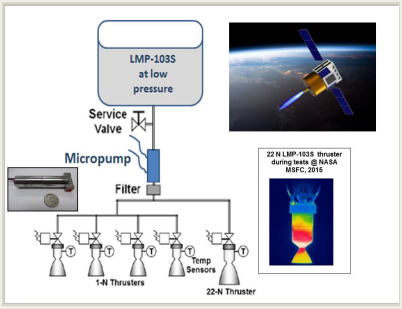
Pump-Fed, Compact, High Performance Green Propulsion System for Secondary Payloads, Phase I

Completed Technology Project (2016 - 2016)

Project Introduction

Flight Works is proposing to expand its micropump-fed propulsion technology to the development of a low cost, compact, low tank pressure, high performance LPM-103S propulsion system for secondary payloads. Along with AF-M315E, LMP-103S is a leading green propellant candidate. Both, with their low vapor pressures, are great candidates for pump-fed systems. LMP-103S thrusters have been flying for over three years onboard the PRISMA spacecraft. Recently, NASA MSFC conducted tests of 5 N and 22 N thrusters. Typically, requirements imposed by the primary mission have led secondary payloads to have very limited propulsion capability. For earth orbiting spacecraft, the requirements to reenter within 25 years can be an issue. For lunar or interplanetary missions, lack of significant ΔV capability limits the science potential. For example, the system in the Mars Cube One 6U spacecraft is only capable of a few tens of m/s. Many such nanosats, including CubeSats slated to accompany the primary spacecraft towards Europa, could greatly benefit from real delta-V capability (> 1 km/s) while reducing risks to the primary payload. Flight Works is proposing to develop that capability by leveraging its experience in micropump-fed propulsion to develop a compact, low-tank-pressure, pump-fed, propulsion system suitable for LMP-103S. With a micropump, the pressurization system is eliminated, the propellant storage and feed system can be designed for low pressures, and lighter, conformal tanks can be used instead of spherical or cylindrical pressurized tanks. This decreases system overall size and mass (and decreases verification costs). Also, many of the (low pressure) components can be made at low cost, for example using additive manufacturing. More generally, the technology is applicable to any propulsion system, whether primary or for attitude control, where hydrazine is currently used, and is competitive with bipropellant systems for microsats due to the reduced system mass.



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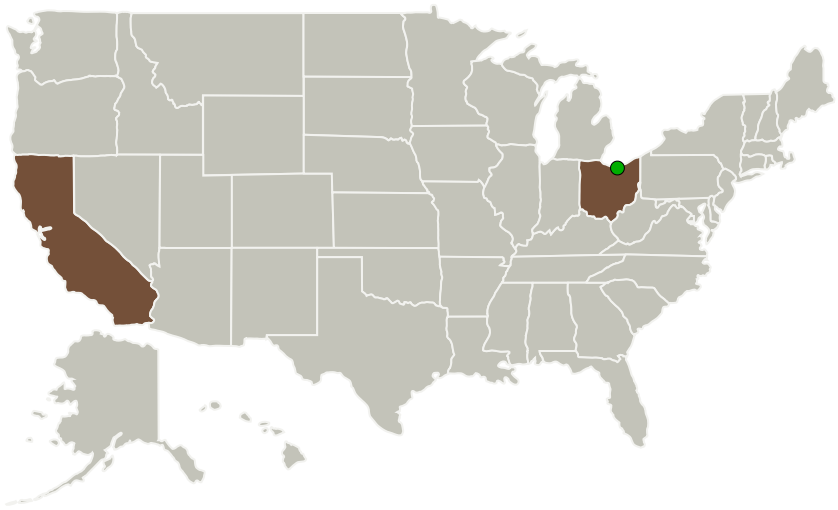
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Flight Works, Inc.	Lead Organization	Industry	Irvine, California
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
California	Ohio

Project Transitions

June 2016: Project Start

December 2016: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139771)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Flight Works, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

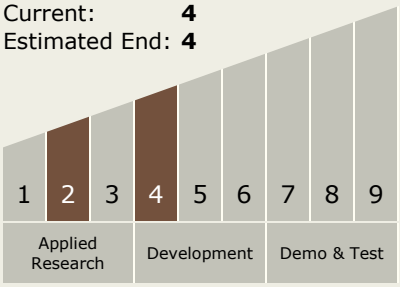
Carlos Torrez

Principal Investigator:

Nadim R Eid

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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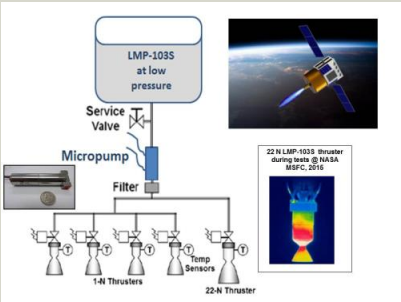
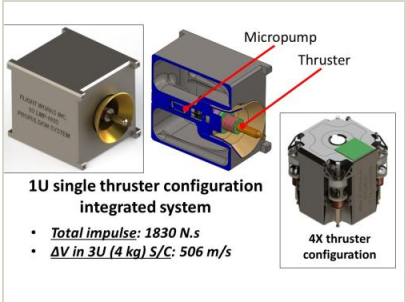
Images



Briefing Chart Image
Pump-Fed, Compact, High Performance Green Propulsion System for Secondary Payloads, Phase I
(https://techport.nasa.gov/image/131324)



Final Summary Chart Image
Pump-Fed, Compact, High Performance Green Propulsion System for Secondary Payloads, Phase I Project Image
(https://techport.nasa.gov/image/128581)

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.2 Earth Storable

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System